

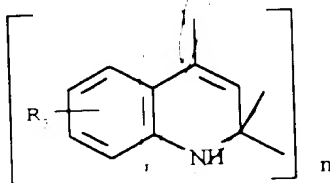
## CLAIMS

What is claimed is:

1. A composition comprising lubricating oil and at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof.
2. The composition of claim 1 wherein the lubricating oil is selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, and polyoleates.
3. The composition of claim 1 wherein the lubricating oil is an API Group I base oil.
4. The composition of claim 1 wherein the lubricating oil is an API Group II base oil.
5. The composition of claim 1 wherein the lubricating oil is an API Group IV base oil.
6. The composition of claim 1 wherein the first antioxidant is of the formula  $R_1-NH-R_2$  where  $R_1$  and  $R_2$  each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms.

7. The composition of claim 1 wherein the first antioxidant is selected from the group consisting of diphenylamine, monoalkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butyl diphenylamine, mono- and/or di-octyl diphenylamine, mono- and/or di-nonyl diphenylamine, phenyl- $\alpha$ -naphthylamine, phenyl- $\beta$ -naphthylamine, diheptyl diphenylamine, mono- and/or di-( $\alpha$ -methylstyryl) diphenylamine, mono- and/or distyryl diphenylamine, 4-(*p*-toluenesulfonamido) diphenylamine, 4-isopropoxy diphenylamine, *t*-octylated N-phenyl-1-naphthylamine, mixtures of mono- and dialkylated *t*-butyl-*t*-octyl diphenylamines, N-phenyl-1,2-phenylenediamine, N-phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-*p*-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-phenyl-*p*-phenylenediamine.
8. The composition of claim 1 wherein the second antioxidant is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof.

9. The composition of claim 1 wherein the second antioxidant is of the structure:



where  $n = 1-1000$  and  $R_3$  is hydrogen, alkyl, or alkoxy.

10. The composition of claim 8 wherein the amount of 2,2,4-trimethyl-1,2-dihydroquinoline or polymer thereof is in the range of about 0.01 to about 10 weight percent.

11. The composition of claim 1 wherein the amount of secondary diarylamine is in the range of from about 0.01 to about 10 weight percent.

12. The composition of claim 1 wherein the ratio the first antioxidant to the second antioxidant is from 1:99 to 99:1.

13. The composition of claim 1 further comprising at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.

14. A composition comprising:  
a lubricating oil selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, polyoleates, an API Group I base oil, an API Group II base oil, and an API Group IV base oil,  
from about 0.01 to about 10 weight percent of at least one first antioxidant selected from the group consisting of diphenylamine, monoalkylated diphenylamine,

dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof,  
3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or  
di-butyl-diphenylamine, mono- and/or di-octyl-diphenylamine, mono- and/or  
di-nonyl-diphenylamine, phenyl- $\alpha$ -naphthylamine, phenyl- $\beta$ -naphthylamine,  
diheptyl-diphenylamine, mono- and/or di-( $\alpha$ -methylstyryl)-diphenylamine,  
mono- and/or distyryl-diphenylamine, 4-(*p*-toluenesulfonamido)-diphenylamine,  
4-isopropoxydiphenylamine, *t*-octylated N-phenyl-1-naphthylamine, mixtures  
of mono- and dialkylated *t*-butyl-*t*-octyl-diphenylamines, N-phenyl-1,2-  
phenylenediamine, N-phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-  
phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-  
*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-*p*-phenylenediamine,  
N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-  
phenyl-*p*-phenylenediamine,

from about 0.01 to about 10 weight percent of a second antioxidant that is 2,2,4-  
trimethyl-1,2-dihydroquinoline or a polymer thereof, the ratio of the first  
antioxidant to the second antioxidant being from 1:99 to 99:1, and,  
optionally,

at least one additional additive selected from the group comprising dispersants,  
detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents,  
antifoamants, friction modifiers, seal swell agents, demulsifiers,  
VI improvers, and pour point depressants.

15. A method of increasing the oxidation stability of a lubricating oil comprising  
adding thereto at least a first antioxidant and a second antioxidant, the first

antioxidant being a secondary diarylamine and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof.

16. The method of claim 15 wherein the lubricating oil is selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, and polyoleates.

17. The method of claim 15 wherein the lubricating oil is an API Group I base oil.

18. The method of claim 15 wherein the lubricating oil is an API Group II base oil.

19. The method of claim 15 wherein the lubricating oil is an API Group IV base oil.

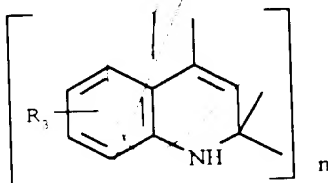
20. The method of claim 15 wherein the first antioxidant is of the formula  $R_1-NH-R_2$  where  $R_1$  and  $R_2$  each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms.

21. The method of claim 15 wherein the first antioxidant is selected from the group consisting of diphenylamine, mono-alkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or

di-butyldiphenylamine, mono- and/or di-octyldiphenylamine, mono- and/or di-nonyldiphenylamine, phenyl- $\alpha$ -naphthylamine, phenyl- $\beta$ -naphthylamine, diheptyldiphenylamine, mono- and/or di-( $\alpha$ -methylstyryl)diphenylamine, mono- and/or distyryldiphenylamine, 4-(*p*-toluenesulfonamido)diphenylamine, 5 4-isopropoxydiphenylamine, *t*-octylated N-phenyl-1-naphthylamine, mixtures of mono- and dialkylated *t*-butyl-*t*-octyldiphenylamines, N-phenyl-1,2-phenylenediamine, N-phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-*p*-phenylenediamine, 10 N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-phenyl-*p*-phenylenediamine.

22. The method of claim 15 wherein the second antioxidant is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof.

23. The method of claim 15 wherein the second antioxidant is of the structure:



where  $n = 1-1000$  and  $R_3$  is hydrogen, alkyl, or alkoxy.

24. The method of claim 22 wherein the amount of 2,2,4-trimethyl-1,2-dihydroquinoline or polymer thereof is in the range of from about 0.01 to about 10 weight percent.

25. The method of claim 15 wherein the amount of secondary diarylamine is in the range of about 0.01 to about 10 weight percent.

26. The method of claim 15 wherein the ratio the first antioxidant to the second antioxidant is from 1:99 to 99:1.

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27. The method of claim 15 further comprising at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.

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28. A method of increasing the oxidation stability of a lubricating oil selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, polyoleates, an API Group I base oil, an API Group II base oil, and an API Group IV base oil, comprising adding thereto:

20 from about 0.01 to about 10 weight percent of at least one first antioxidant selected from the group consisting of diphenylamine, mono-alkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butylidiphenylamine, mono- and/or di-octyldiphenylamine, mono- and/or

di-nonyldiphenylamine, phenyl- $\alpha$ -naphthylamine, phenyl- $\beta$ -naphthylamine,  
diheptyldiphenylamine, mono- and/or di-( $\alpha$ -methylstyryl)diphenylamine,  
mono- and/or distyryldiphenylamine, 4-(*p*-toluenesulfonamido)diphenylamine,  
4-isopropoxydiphenylamine, t-octylated N-phenyl-1-naphthylamine, mixtures  
5 of mono- and dialkylated t-butyl-t-octyldiphenylamines, N-phenyl-1,2-  
phenylenediamine, N-phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-  
phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-  
*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-*p*-phenylenediamine,  
N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-  
10 phenyl-*p*-phenylenediamine,

from about 0.01 to about 10 weight percent of a second antioxidant that is

2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof, the ratio of the  
first antioxidant to the second antioxidant being from 1:99 to 99:1, and,  
optionally,

15 at least one additional additive selected from the group comprising dispersants,  
detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents,  
antifoamants, friction modifiers, seal swell agents, demulsifiers,  
VI improvers, and pour point depressants.